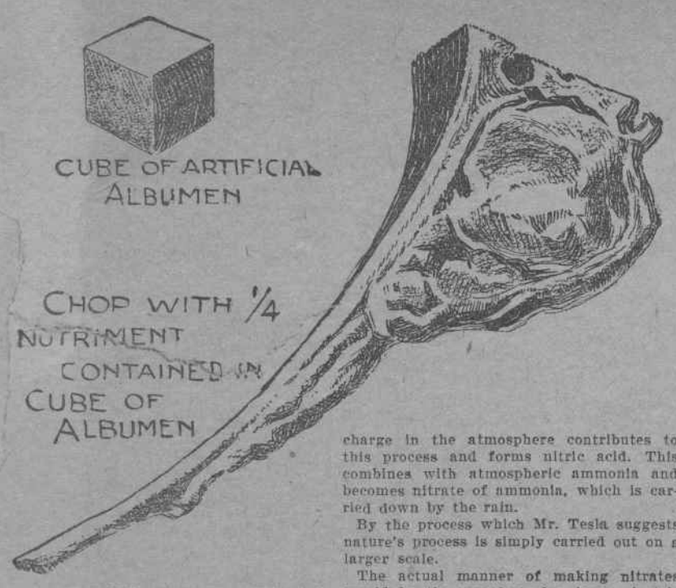
HOW CHEMISTRY AND ELECTRICITY ARE PREPARING TO FEED US WITH ARTIFICIAL FOOD WHEN EARTH'S POPULATION OUTGROWS OUR WHEAT FIELDS.



WORLD'S WHEAT SUPPLY TO FAIL IN 1931.

By Sir William Crookes.

In His Address Last Week as President of the British Association for the Advancement of Science.

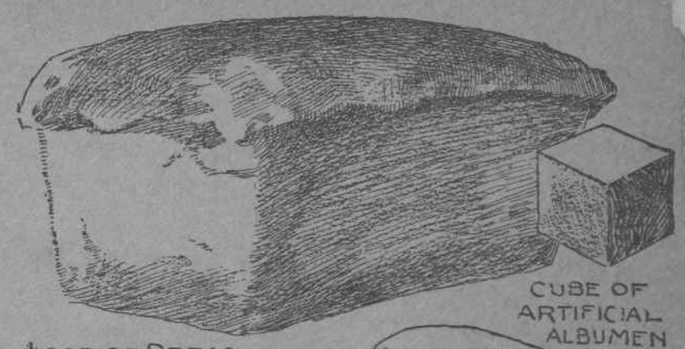
THE world's growing wheat supply will fail to keep pace with the needs of growing population beyond the year 1931. The supply of fixed nitrogen, mostly in the form of nitrate of soda, is not inexhaustible, and may come to an end. The store of nitrogen in the atmosphere is practically unlimited, and its fixation for use as manure is one of the great discoveries awaiting the practical working out by chemists.

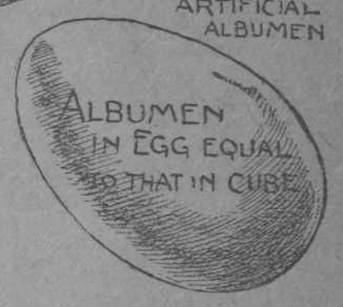
I believe the solution of the problem may be found in burning nitrogen in the air by means of a powerful electrical current. By using the power of Niagara Falls for this purpose nitrates could be produced at a cost of $25 a ton. By spreading a moderate amount of this fertilizer over exhausted wheat fields they could be made to produce thirty bushels per acre, which is the normal yield of virgin soil.

HOW ALBUMEN CAN BE MADE IN A LABORATORY.

By Professor Lilienfeld, of Vienna.

I HAVE discovered a process of making albumen artificially out of coal tar products. It has all the qualities of albumen found in the egg and other forms of animal and vegetable life. By the laboratory process I have discovered it can be made so cheaply as to furnish a sufficient supply of food for a man at a cost of eight cents a day. It occurs in the form of a brown powder, and has a taste resembling egg albumen.





THE announcement that in thirty-three years, exactly one generation hence, the human race on this globe will be brought face to face with starvation would not be credited if made by any less authority than Sir William Crookes, of London, a scientist of world-wide reputation.

But that in substance is the astonishing text which Professor Crookes chose for his opening address as president of the British Association for the Advancement of Science a week ago.

By the most careful calculation he estimates that in 1931 the population of the world will have so increased that the wheat supply will be insufficient to furnish human beings with bread.

There is, of course, the possibility that unforeseen plagues and wars may so devastate the earth within the next few years as to put off the threatened famine for some years. But even then it is likely to occur within the lifetime of millions of people now living.

Leading men of science in America have been deeply impressed by Professor Crookes's announcement. Dr. Rudolph A. Witthaus, of New York, professor of chemistry in Cornell Medical College, says:

"I should accept Professor Crookes's prediction of the exhaustion of the world's wheat supply as reliable. He is not likely to make a precipitate statement. He has undoubtedly arrived at his conclusion after a most careful calculation."

Dr. Witthaus then points out that this may hasten the making of artificial foods by chemical means, along the line of Dr. Lilienfeld's recent discoveries in the making of albumen.

Nikola Tesla, the distinguished electrician, tells of another way in which the food supply of the world may be artificially increased.

It is by converting the nitrogen of the air into fertilizer by electrical means, and applying this substance to enrich the worn-out wheat fields of the world.

This, in fact, is the plan which Professor Crookes proposes as being the best means of fertilizing the exhausted fields of the world, and make them capable of continuing to produce like virgin soil for thousands of years to come.

Niagara Falls, he suggests, presents the best opportunity for solving this great human problem, for here is where the wonderful electrical process of making fertilizer out of the air can be done the cheapest, owing to the almost unlimited power which Nature has here supplied.

Nitrate of soda can be produced by this means for $25 a ton. A ton of this substance is sufficient to fertilize from five to ten acres according to the character of the soil. This would make the fields yield under proper cultivation and irrigation thirty bushels per acre, which is now the average yield of the best virgin wheat fields of the Red River Valley in North Dakota and Minnesota.

Nikola Tesla states that the extracting of fertilizer from the inexhaustible source of the atmosphere is perfectly feasible. All that is necessary is the construction of a proper electrical plant to put into operation a process that has already been successfully done on a small scale in the laboratory.

It would be simply the copying of nature's own process of fertilizing the fields. Every one has heard that rain gathers up some nitrogenous substances of the air, and carries them down to the earth and enriches the ground. Every electrical discharge in the atmosphere contributes to this process and forms nitric acid. This combines with atmospheric ammonia and becomes nitrate of ammonia, which is carried down by the rain.

By the process which Mr. Tesla suggests nature's process is simply carried out on a larger scale.

The actual manner of making nitrates would be the erection of a large electric plant, with a tall metallic chimney. This would not be for carrying off smoke, on account of water power supplying the mechanical force. But in this great chimney nature's thunderstorms would be reproduced.

HOW ELECTRICITY WILL FURNISH THE WORLD WITH FOOD.

By Nikola Tesla.

THE economical conversion of ordinary electrical currents into high alternating currents opens up new possibilities. One of these is the combination of atmospheric nitrogen and the production of nitric acid, ammonia, and their salts for fertilizing purposes. I have been following up for a long time the process of utilizing atmospheric nitrogen on an industrial scale by mechanical power alone.

If merely fertilizers of the soil should be manufactured by this means the benefits to humanity would be incalculable. It would supply nitrates in such quantity that the exhausted fields of even the oldest and most densely populated countries could easily support their people.

The waterfalls of the world are the most ideal power for doing this work. By using them we exhaust no coal deposits or forest reserves. We simply use a power that would otherwise go to waste in making electrical currents that can make all the fields of the world enormously productive.

In Niagara Falls we have, as Professor Crookes has pointed out and as I have many times before suggested, the greatest agent ever given to man. It signifies the subjugation of natural forces to the service of man, the discontinuance of primitive methods and the relief of millions from want and suffering.

BY DR. RUDOLPH A. WITTHAUS.

Professor of Chemistry, Physics and Toxicology of Cornell University Medical College, of New York.

I SHOULD accept Professor Crookes's prediction of the exhaustion of the world's wheat supply as reliable. Professor Crookes is not likely to make a precipitate statement. He has undoubtedly arrived at this conclusion after a most careful calculation.

This would naturally give an impetus toward making foods by artificial means, possibly along the lines of Lilienfeld's experiments in making chemical albumen. How far this process can be carried is difficult to say at the present time, but it is not safe to say that anything is impossible.

Tesla's electrical process of converting the nitrogen of the air into nitrates for fertilizing wheat fields.

Science Trying to Make Food Artificially.

Statement by Professor E. E. Elwell, Acting Chief Chemist of the Department of Agriculture:

We do not know how much will be accomplished in the future in respect to the artificial production of aliment suitable for human beings. Wonderful things in that line may be accomplished, but our attitude is that of awaiting developments. Many remarkable results have been already obtained tending in that direction, but most of them have not as yet achieved commercial usefulness.

You see, it is one thing to produce by artifice in the laboratory a food product at an expense of hundreds of dollars per drachm. It is quite another thing to make by chemical art a food product that can compete with nature, at a few cents a pound.

The subject of artificial albumen is new to me, and I have no exact knowledge respecting it. We do know that quite a number of products useful for food purposes have been obtained already by chemists. For example, caffeine has been obtained from coal tar. This is the essential principle of coffee; it is also the essential principle of tea.

Shall we ever be able, through the medium of the laboratory, to furnish the population of this country with coffee and tea? That is a question largely dependent upon whether the essential principles can be cheapened by the laboratory to such an extent as to make coffee and tea available for the people at large at rates less than those which now are the market prices.

It is, after all, a question of price. The scientific chemist may produce an article identical with a costly food product, but if he cannot make it equally good at an equal price, it is merely a curiosity and of no practical usefulness.

A German chemist named Fischer has accomplished some amazing things in the artificial production of sugars. He has not been able to reproduce cane sugar, but he has made glucose and fruit sugar in the laboratory. Of course, these are most valuable food products, if they can be manufactured at a price less than that which nature charges. Such sugars are made of coal tar products. Coal tar is a wonderful substance, being a compound of such a multitude of things that the materials which it furnishes can be utilized for making almost an infinity of valuable articles. When it is distilled it gives birth to a great variety of components, each of which is composed of ever so many compounds that yield substances of value in medicine and for a variety of other purposes.

From coal tar has been obtained an artificial vanillin, which is exactly equivalent to the crystallized product of the vanilla bean. It has already become of commercial importance. Fischer has obtained in his laboratory a number of kinds of sugars which were never known before. In fact, they are not made by nature, so far as is known. Among other important products obtained by synthesis are certain volatile oils, like lemon oil and oil of wintergreen, the latter being made from wood alcohol and salicylic acid.

The chemical formula, i. e., the make-up, of starch and sawdust is pretty much the same, though it would not be correct to say that it is exactly the same. From this fact it has been imagined that at a future day sawdust might be transformed directly into one of nature's most important food materials. A product of the laboratory useful as a substitute for sugar is saccharine, which is from 300 to 500 times as sweet as cane sugar. It is obtained from coal tar.

How Prof. Lilienfeld Makes Artificial Albumen Food Out of Coal Tar in His Laboratory in Vienna.

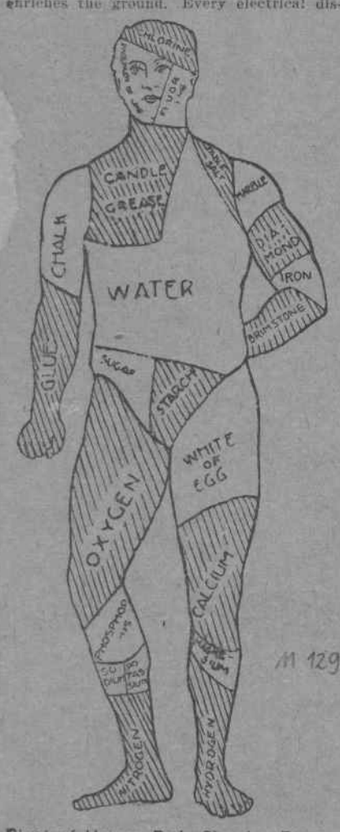


Chart of Human Body Showing Proportions Formed by Albuminous White of Egg, Nitrogen and Other Substances.

At the foot of it would be a powerful electric coil and over it a high alternating oscillator. From this would extent upward in the middle of the chimney a large copper wire like a lightning rod. When the high alternating current is turned on a most wonderful phenomenon would take place. The interior of the chimney would be like a mass of electric fire or glowing phosphorus.

Out of this intense chemical action the nitrogen of the atmosphere would be condensed and form at the bottom of the chimney in the form of nitric acid, to be drawn off like molten metal from a retort. This liquid could easily be reduced into salts, the form most useful in applying for fertilizer.

If all the surplus water power of the world were employed in this way it is estimated that sufficient fertilizer could be made to forever keep the wheat fields of the world productive and enable even the oldest and most densely populated countries to raise their own food supplies.

Wheat takes up the largest proportion of nitrates from the soil and consequently makes the most nourishing nitrogenous grain food.

The nitrogen in the atmosphere is the most mysterious element of nature. It is not absorbed by plants and converted into food products or vegetable structure. It plays no active part in the processes of combustion and of animal respiration. In both cases it appears to merely dilute the powerful oxygen.

In respiration, however, it seems to be essential, for no animal could live healthily for any length of time in pure oxygen. It thought also that atmospheric nitrogen in an indirect way contributes toward the building up of nitrogenous organic matter.

It is a singular coincidence that almost at the same time that Professor Crookes arrived at the alarming calculation that the human race has almost reached the limit of population of the world, owing to failure of food supply, another great scientist should discover how to make food directly from mineral substances.

Professor Lilienfeld, of Vienna, announced to the professional world a few weeks ago that he could make albumen in a laboratory.

It has always been believed hitherto that albumen could be produced only in nature's laboratory by the vegetable world. It then becomes the essential nourishing element of all human and animal foods. The purest form in which it appears is in the white of an egg.

But Professor Lilienfeld went through the operation of producing albumen from coal tar before an assembly of physicians and scientists and no one of the company had the least doubt that the result was all that was claimed for it.

The raw product was a dark brown powder with a taste almost identical to egg albumen.

The importance of this discovery is almost beyond estimate. Artificial albumen at a low cost will most surely revolutionize the method of food production for the entire world and render possible many things that are now impossible.

An ounce of pure albumen has about twenty times the nourishing power of the same weight of meat. It will nearly equal a peck of potatoes, and has besides the quality of not interfering with the digestive apparatus, even though eaten exclusively for months at a time. It is the active principle of all animal food and the developing energy of all embryonic life.

At present albumen is expensive, except for a short period of each year. In meat it costs over twenty-five cents a pound. In hen eggs the cost varies from fifteen cents a pound to sixty cents a pound. And if the meat and eggs are not fresh the nourishing quality of the albumen is greatly lessened.

With artificial albumen man will no longer be dependent upon living animals for meat foods, but will produce them in the laboratory.

It could be made so economically as to furnish sufficient for a man's daily food for eight cents. This means that a year's food supply would cost but $29.20.

This supply a man could buy at one time and carry away in an ordinary market basket.

There would be no danger of it spoiling or causing excessive thirst, as all salted meats do. This prepared albumen is the ideal food, suited for all times and all conditions, and not at all likely to cause such diseases as scurvy.

Naturally one asks how albumen can be made from coal tar and why it is so nourishing and acceptable to the stomach.

Both questions are questions of atomic chemistry.

The components of albumen and coal tar are almost the same, except that they exist in different proportions in the two substances.

Albumen is composed of carbon, hydrogen, nitrogen, oxygen and sulphur. These are all of the principal elements of nature. Coal tar contains the same elements, but more carbon and oxygen. The atoms are all then in coal tar, and if the chemist can isolate them and then combine them in the proper proportions there is no chemical reason why albumen should not be the result.

The method Professor Lilienfeld followed to produce this artificial albumen has not been made public, but it is understood that the chemical combination is phenol, amydo-acetic acid and phospho-chloric oxide. He demonstrated its identity with natural albumen by several of the well-known reaction tests.

Albumen agrees with the stomach because it contains so many of the elements that the secretions are not exhausted in converting it into tissue cells.

It is this quality that makes it possible to eat albumen day after day for months without causing distress to the stomach.

The proportion of the human body which albumen, nitrogen and other substances form are shown in an accompanying picture.

By a laboratory process a quantity of albumen compressed into a cube slightly less than an inch through would contain four times as much nourishment as a juicy lamb chop. The same size cube of albumen would be equal to an egg in sustaining quality. It would contain six times as much as a loaf of baker's white bread.

Should artificial albumen prove all that is claimed for it there is no reason to believe that man would find it necessary or desirable to live on it exclusively. In fact, his appetite would most likely object. This is one of the instances where science cannot overcome nature. But artificial albumen, as an accompaniment of starchy and sugary foods, together with a little acid, would be a boon to mankind. And if necessity called for it albumen exclusively would sustain life a long time—at least a year longer than any other exclusive food would.

Scientists all over the world are taking a deep interest in Professor Lilienfeld's discovery. All feel that it is possible to make albumen from coal tar. And when the wonders of "synthetical" chemistry are considered there is no need of surprise.

On the subject of chemical synthesis the entire chemical world is aroused, and scores of laboratories in Germany and elsewhere are actively experimenting, for discoveries along these lines have enormous commercial possibilities in them. Substances that hitherto have been produced only by processes of nature are now "built up" in the laboratories with great exactness, meeting every test. What is more, they can be made in this way at far less cost than they can be taken from some plant, frequently a rare one. The essential element, the extract, instead of being distilled or yielded to some complicated method of treatment, is made up in the reverse way—working backward, as it were.

Sponsor for a Hundred Babies.

In the small town of Langton, Spilsby, England, there lives a woman who has become famous as being the sponsor of one hundred babies.

Mrs. Ann Fletcher, who has acted as godmother so many times, is childless, but she dearly loves children, and, being so unfortunate as not to be able to carry her own baby up to the baptismal font, her neighbors consoled her by allowing her to take their children to the altar.

This pleased her so much that every new baby born in the hamlet was taken to her, and in a village of only 150 she has now carried the one hundredth baby up the churchyard path.

A Year's Supply of Artificial Albumen Food Could Be Purchased for $29.20 and Carried in a Basket to the Klondike.